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$$=\int_0^a[a-\surd(a^2-x^2)]\left(\frac{x}{2}\surd[4a^2-x^2]-\tfrac{3}{2}x\surd[a^2-x^2]+2a^2\sin^{-1}\frac{x}{2a}\right.$$

$$\left.-\frac{a^2}{2}\sin^{-1}\frac{x}{a}\right)dx=a^4\int_0^{\frac{1}{2}\pi}(1-\cos\theta)\,[\tfrac{1}{2}\sin\theta\,\surd(4-\sin^2\theta)-\tfrac{3}{2}\sin\theta\cos\theta$$

$$+2\sin^{-1}(\tfrac{1}{2}\sin\theta)-\tfrac{1}{2}\theta]\cos\theta\,d\theta=a^4(\tfrac{3}{2}\surd3-\tfrac{29}{12}+\frac{\pi^2}{32}+\frac{\pi}{12})$$

$$-\,a^4\int_0^{\frac{1}{2}\pi}[\tfrac{1}{2}\sin\theta\,\surd)4-\sin^2\theta)+2\sin^{-1}(\tfrac{1}{2}\sin\theta)]\cos^2\theta\,d\theta$$

$$=a^4(\tfrac{3}{2}\surd3-\tfrac{29}{12}+\frac{\pi^2}{32}+\frac{\pi}{12})-a^4\int_0^{\frac{1}{2}\pi}(2\sin\theta-\tfrac{1}{8}\sin^2\theta+\frac{15}{2^7}\sin^3\theta-\frac{1}{2^{10}}\sin^4\theta$$

$$+\frac{763}{2^{15}}\sin^5\theta-\frac{7}{2^{18}}\sin^6\theta+\frac{10219}{2^{22}}\sin^7\theta-\ldots)\cos^2\theta\,d\theta.$$

$$\therefore M=a^4(\tfrac{3}{2}\surd3-\tfrac{29}{12}+\frac{\pi^2}{32}+\frac{\pi}{12}-0.6595495)=0.0412517a^4.$$

$$\frac{16M}{3a^4(4-\pi)^2}=\frac{0.6600272}{2.2108850}=\tfrac{3}{10},\text{ nearly, }=.299.\quad\therefore p=\tfrac{1}{3}+\tfrac{3}{10}=\tfrac{19}{30},\text{ nearly.}$$

PROBLEMS FOR SOLUTION.

ALGEBRA.

208. Proposed by W. J. GREENSTREET, M. A., Stroud, England.

Find the conditions that the roots of $x^2+px+q=0$ may not lie between -1 and $+1$.

209. Proposed by PROFESSOR E. B. ESCOTT, Ann Arbor, Mich.

Solve, $bx^2+cy^2+az^2=ba^2+cb^2+ac^2$,
$cx^2+ay^2+bz^2=ab^2+bc^2+ca^2$,
$xyz=abc$.

210. Proposed by B. F. FINKEL, Ph. D., Drury College, Springfield, Mo.

Simplify, $\log[\sqrt[3]{(137)}\,\sqrt[7]{(56)}\div\sqrt[10]{(187)}\,\sqrt[4]{(75)}]$.